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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/740,424	12/19/2000	Kiyotaka Tsukada	057329-0001	5114

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EXAMINER

CHU, CHRIS C

ART UNIT	PAPER NUMBER
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2815

DATE MAILED: 01/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/740,424

Applicant(s)

TSUKADA ET AL.

Examiner

Chris C. Chu

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on 05 November 2003.

2a) ☒ This action is **FINAL**.

2b) ☐ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1, 2 and 4 - 9 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1, 2 and 4 - 9 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some * c) ☒ None of:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.

4) ☐ Interview Summary (PTO-413) Paper No(s). _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on November 5, 2003 has been received and entered in the case.
-

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 4, 7 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. '550 in view of Beaman et al. '160.

Regarding claim 1, Tsuji et al. discloses in e.g., Fig. 23, column 17, line 28 and column 18, lines 33 - 67 a printed circuit board comprising:

- an insulative substrate (51b);
- a conductor pattern (70) formed on the substrate; and
- a protection film (51a) coating the substrate and the conductor pattern, wherein the conductor pattern (70) includes
 - o a bottom surface directly contacting the substrate,
 - o a top surface opposite to the bottom surface, and

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- a pair of flat angled side surfaces extending from the bottom surface to the top surface,
- each of the side surfaces having a lower portion covered by the protection film,
- wherein both the bottom surface and the top surface have widths, the lower portion of each side surface covered by the protection film and the conductor pattern have heights, and
- wherein the width of the bottom surface is greater than the width of the top surface.

Tsuji et al. does not disclose an upper portion of the conductor pattern exposed from the protection film. However, Beaman et al. teaches in Fig. 8 and column 5, line 46 – column 6, line 9 an upper portion (61) of a conductor pattern (60 and 61) exposed from a protection film (64) by forming a depression (65) around the upper portion of the conductor pattern (60 and 61). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Tsuji et al. by using the depression in the protection film to expose the upper portion of the conductor pattern as taught by Beaman et al. The ordinary artisan would have been motivated to modify Tsuji et al. in the manner described above for at least the purposes of containing any high temperature creep of the solder (column 6, lines 6 - 9); and preventing the solder ball from peeling off from the conductor pattern, thereby enhancing the physical and electrical connection between the solder ball and the conductor pattern.

Regarding claim 2, Tsuji et al. discloses in e.g., Fig. 23 the conductor pattern having a trapezoidal cross-section.

Regarding claim 4, Tsuji et al. and Beaman et al. disclose a height of the lower portion of each side surface covered by a protection film in a conductor pattern being 50% or greater and less than 100% of the height of the conductor pattern (see Fig. 8 of Beaman et al.).

Regarding claim 7, while Tsuji et al. does not disclose any particular dimensions that may be employed for the trapezoidal conductive pattern, and therefore does not disclose the 0.1 to 2.5 ratio of claim 7, this claimed ratio range does not produce any unexpected results. Rather, the selection of dimensions that would satisfy this ratio constitutes an obvious optimization of dimensions determinable by the skilled artisan through routine experimentation because the particular dimensions ultimately chosen would have been based upon the balancing of well known factors such as (1) the desire to minimize the vertical and lateral dimensions to enhance miniaturization, and (2) the desire to make these dimensions sufficiently large to ensure adequate electrical and physical connection.

Regarding claim 8, Tsuji et al. discloses in e.g., Fig. 5B, Fig. 23, column 17, line 28 and column 18, lines 33 - 67 a method for fabricating a printed circuit board comprising the steps of:

- etching an insulative substrate (70 and step S13a – S17) including a conductor to form a conductor pattern (14) having a bottom surface directly contacting the substrate, a top surface opposite to the bottom surface, and a pair of flat angled side surfaces extending from the bottom surface to the top surface, wherein the conductor pattern is formed so that a width of the bottom surface is greater than a width of the top surface; and
- applying an insulative protection film (51a) to the conductor pattern and the substrate.

Tsuji et al. does not disclose removing part of the protection film to expose the top surface and a part of each of the side surfaces. However, Beaman et al. teaches in Fig. 8 and column 5, line 46 – column 6, line 9 removing part (65) of a protection film (64) to expose the top surface and a part of each of the side surfaces of a conductor pattern (60 and 61). Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Tsuji et al. by using the method of removing part of the protection film to expose the upper portion of the conductor pattern as taught by Beaman et al. The ordinary artisan would have been motivated to modify Tsuji et al. in the manner described above for at least the purposes of containing any high temperature creep of the solder (column 6, lines 6 - 9); and preventing the solder ball from peeling off from the conductor pattern, thereby enhancing the physical and electrical connection between the solder ball and the conductor pattern.

4. Claims 5, 6 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuji et al. and Beaman et al. as applied to claim 1 above, and further in view of Lee '399.

Regarding claims 5, 6 and 9, Tsuji et al. and Beaman et al. disclose the claimed invention except for the top surface and the upper portion of the side surfaces being coated by a plating and a solder ball contacting the plating at the upper portion of the side surfaces. However, Lee teaches in e.g., Fig. 4E a top surface and the upper portion of the side surfaces of a conductor pattern (100) being coated by a plating (110 and 120) and a solder ball (150) contacting the plating (110 and 120) at the upper portion of the side surfaces. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to further modify Tsuji et al. by using the plating to coat on the conductor pattern as taught by Lee. The ordinary

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artisan would have been motivated to further modify Tsuji et al. in the manner described above for at least the purpose of allowing the solder ball to be more easily fused on the land metal element (column 2, lines 22 - 32).

Response to Arguments

5. Applicant's arguments with respect to claims 1 and 8 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Carey et al., Tsukada et al., Tsukada et al. (JP), Capote et al. and Ohuchi et al. disclose a semiconductor device.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

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however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

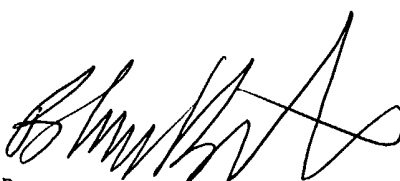
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 7:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone number for the organization where this application or proceeding is assigned is (703) 308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Chris C. Chu
Examiner
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C.C.
25/01/04 17:06:39



B. WILLIAM BAUMEISTER
PRIMARY EXAMINER